

**Multicoat color and/or effect coating system, process
for producing it and its use**

What is claimed is:

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1. A multicoat color and/or effect coating system ML
for a primed or unprimed substrate, comprising,
lying above one another in the stated sequence:

10 (1) a surfacer coat FL which absorbs mechanical
energy, and

(2) a color and/or effect topcoat DL

15 or

(1) a surfacer coat FL which absorbs mechanical
energy,

20 (2) a color and/or effect basecoat BL, and

(3) a clearcoat KL

or

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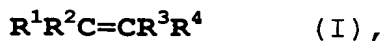
(1) a color and/or effect basecoat BL and

(2) a clearcoat KL,

characterized in that at least one coat FL and/or
DL or BL and/or KL or FL, BL and/or KL, preferably
5 at least two coats FL, BL and/or KL or all coats
FL and DL or BL and KL or FL, BL and KL of the
multicoat system ML having being produced from a
coating material comprising at least one
constituent (A) preparable by free-radical
10 polymerization of

a) at least one olefinically unsaturated monomer
and

15 b) at least one olefinically unsaturated monomer
different than the olefinically unsaturated
monomer (a) and of the general formula I



20 in which the radicals R^1 , R^2 , R^3 and R^4 each
independently of one another are hydrogen atoms
or substituted or unsubstituted alkyl,
cycloalkyl, alkylcycloalkyl, cycloalkylalkyl,
25 aryl, alkylaryl, cycloalkylaryl, arylalkyl or
arylcycloalkyl radicals, with the proviso that
at least two of the variables R^1 , R^2 , R^3 and R^4

are substituted or unsubstituted aryl,
arylalkyl or arylcycloalkyl radicals,
especially substituted or unsubstituted aryl
radicals;

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in an aqueous medium.

2. A process for producing a multicoat color and/or
effect coating system ML on a primed or an
10 unprimed substrate by

(I) preparing a surfacer film by applying a
surfacer to the substrate,

15 (II) curing the surfacer film to give the
surfacer coat FL,

(III) preparing a solid-color topcoat film by
applying a solid-color coat material to the
20 surfacer coat FL, and

(IV) curing the solid-color topcoat film DL
[sic] to give the solid-color topcoat DL,

25 or

(I) preparing a basecoat film by applying a
basecoat material to the substrate,

(II) drying the basecoat film,

(III) preparing a clearcoat film by applying a
clearcoat material to the basecoat film,
5 and

(IV) jointly curing the basecoat film and the
clearcoat film to give the basecoat BL and
the clearcoat KL,

10

or

(I) preparing a surfacer film by applying a
surfacer to the substrate,

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(II) curing the surfacer film to give the
surfacer coat FL,

(III) preparing a basecoat film by applying a
basecoat material to the surfacer coat FL,

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(IV) drying the basecoat film,

(V) preparing a clearcoat film by applying a
clearcoat material to the basecoat film,
25 and

(VI) jointly curing the basecoat film and the clearcoat film to give the basecoat BL and the clearcoat KL,

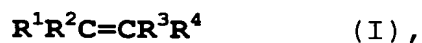
5 characterized in that at least one, preferably at least two and in particular all of the coating materials employed in each case comprise(s) at least one constituent (A) preparable by free-radical polymerization of

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a) at least one olefinically unsaturated monomer,

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b) at least one olefinically unsaturated monomer different than the olefinically unsaturated monomer (a) and of the general formula I



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in which the radicals R^1 , R^2 , R^3 and R^4 each independently of one another are hydrogen atoms or substituted or unsubstituted alkyl, cycloalkyl, alkylcycloalkyl, cycloalkylalkyl, aryl, alkylaryl, cycloalkylaryl, arylalkyl or arylcycloalkyl radicals, with the proviso that at least

two of the variables R^1 , R^2 , R^3 and R^4 are substituted or unsubstituted aryl, arylalkyl or arylcycloalkyl radicals, especially substituted or unsubstituted aryl radicals;

in an aqueous medium.

3. The multicoat system ML as claimed in claim 1 or process as claimed in claim 2, characterized in that the constituent (A) of the coating material is obtainable by

(i) subjecting at least one monomer (a) and at least one monomer (b) to free-radical polymerization in an aqueous medium, and then

(ii) reacting the resultant reaction product with at least one further monomer (a) under free-radical conditions.

4. The multicoat system ML as claimed in claim 1 or 3 or process as claimed in claim 2 or 3, characterized in that the aryl radicals R^1 , R^2 , R^3 and/or R^4 of the compound (b) comprise phenyl or naphthyl radicals, especially phenyl radicals.

5. The multicoat system ML as claimed in any of claims 1, 3 and 4 or process as claimed in any of claims 2 to 4, characterized in that the substituents in radicals R^1 , R^2 , R^3 and/or R^4 of the compound (b) are electron-donating or electron-withdrawing atoms or organic radicals, especially halogen atoms, nitrile, nitro, partially or fully halogenated alkyl, cycloalkyl, alkylcycloalkyl, cycloalkylalkyl, aryl, alkylaryl, cycloalkylaryl, arylalkyl and arylcycloalkyl radicals; aryloxy, alkyloxy and cycloalkyloxy radicals; arylthio, alkylthio and cycloalkylthio radicals; hydroxyl groups and/or primary, secondary and/or tertiary amino groups.

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6. The multicoat system ML as claimed in claim 1 or any of claims 3 to 5 or process as claimed in any of claims 2 to 5, characterized in that monomers (a) comprise

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a1) (meth)acrylic esters which are essentially free from acid groups;

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a2) monomers which carry per molecule at least one hydroxyl group, amino group, alkoxymethylamino group or imino group and are essentially free from acid groups;

- a3) monomers which carry per molecule at least one acid group which can be converted into the corresponding acid anion group;
- 5 a4) vinyl esters of alpha-branched monocarboxylic acids having 5 to 18 carbon atoms in the molecule;
- 10 a5) reaction products of acrylic acid and/or methacrylic acid with the glycidyl ester of an alpha-branched monocarboxylic acid having 5 to 18 carbon atoms per molecule;
- 15 a6) cyclic and/or acyclic olefins;
- a7) (meth)acrylamides;
- a8) monomers containing epoxide groups;
- 20 a9) vinylaromatic hydrocarbons;
- a10) nitriles;
- 25 a11) vinyl compounds, especially vinyl halides and/or vinylidene dihalides, N-vinylpyrrolidone, vinyl ethers and/or vinyl esters;

a12) allyl compounds, especially allyl ethers and allyl esters;

5 a13) polysiloxane macromonomers having a number-average molecular weight M_n of from 1000 to 40 000 and having on average from 0.5 to 2.5 ethylenically unsaturated double bonds per molecule; and/or

10 a14) acryloxysilane-containing vinyl monomers, preparable by reacting hydroxyl-functional silanes with epichlorohydrin and then reacting the reaction product with (meth)acrylic acid and/or with hydroxyalkyl
15 and/or hydroxycycloalkyl esters of (meth)acrylic acid (monomers a2).

7. The multicoat system ML as claimed in claim 1 or any of claims 3 to 6 or process as claimed in any
20 of claims 2 to 6, characterized in that the coating material further comprises at least one of the following constituents:

A') at least one binder having at least one
25 functional group (afg) which is able to undergo thermal crosslinking reactions with complementary functional groups (bfg) in the crosslinking agent (B);

- 5 B) at least one crosslinking agent having at least two functional groups (bfg) which are able to undergo thermal crosslinking reactions with complementary functional groups (afg) in the constituent (A),
- 10 C) at least one constituent which is crosslinkable with actinic radiation,
- D) at least one photoinitiator,
- E) at least one thermal crosslinking initiator,
- 15 F) at least one reactive diluent curable thermally and/or with actinic radiation,
- G) at least one coatings additive, and/or
- 20 H) at least one organic solvent.

8. The use of the multicoat system ML as claimed in claim 1 or any of claims 3 to 7 or of the multicoat system ML produced by the process as claimed in any of claims 2 to 7 for automotive OEM finishing and refinishing, industrial coating, including coil coating and container coating, the coating of plastics, and furniture coating.

9. A primed or an unprimed substrate comprising at least one multicoat system ML as claimed in claim 1 or any of claims 3 to 7 or at least one multicoat system ML produced by the process as claimed in any of claims 2 to 7.